SUB BH

a I CLAIM
~~CLAIMS~~

1. A method for fabricating drip irrigation pipes, or similar, comprising the following steps:

a) Extruding a plastic pipe (5) through an extruding head (1);

b) Progressively reducing the pipe (5), from the diameter coming out of the extruding head to a final diameter, during which reduction the extruded pipe (5) has a conical length.

c) Inserting a plurality of dripping elements (4) consecutively and keeping pace with the advance of the extruded pipe, through the extruding head (1) and into the extruded pipe (5);

d) Advancing each dripping element (4) to an area of the pipe (5), whereat each dripping element (4) is brought to contact with a predetermined area of the inner surface of the pipe (5), while having a predetermined speed relative to the speed of the pipe when contact occurs;

e) Cooling the pipe (5) with the dripping elements;

f) Perforating the pipe (5) where the dripping elements (4) are provided.

Characterized in that

g) at least before the contact between the pipe (5) and each dripping element (4) occurs, the dripping element (4) has a higher speed than the pipe (5).

2. A method as claimed in claim 1, characterized in that the speed of the dripping elements (4) is higher than that of the pipe (5), at least immediately before the contact with the pipe (5) occurs and until the

dripping element (4) hits the wall of the pipe (5).

3. A method as claimed in claims 1 ~~or 2,~~ characterized in that the mutual orientation of the inner surface of the pipe (5) and of the facing contact surface of the dripping elements (4) in the area or moment of contact may be chosen in such a way as to vary at will, within certain limits, the transverse component of the force, i.e. the one directed radially towards the pipe (5) when the dripping elements (4) hit the pipe (5).

4. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that the higher speed of the dripping elements (4) when they hit the inner surface of the pipe (5) is such as to generate an impact mark in the inner surface of the pipe (5), which may also be a sort of wedging mark.

5. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that the contact between the dripping elements and the inner surface of the pipe occurs in the conical narrowed length of the pipe, the path of the dripping elements (4) converging at least on one side towards the conical wall of the pipe (5).

6. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that after the first contact between the dripping elements (4) and the pipe (5) has occurred, a path length is provided, wherein a mutual compression force is exerted by the dripping elements (4) and by the pipe (5).

7. A method as claimed in claim 6, characterized in

that the compression force is exerted while continuing to advance, drag and/or push the dripping elements (4) with the same force or at the same conditions as those provided before contact with the pipe (5).

8. A method as claimed in claim 7, characterized in that the force wherewith and the conditions whereat the dripping elements (4) are dragged, advanced and/or pushed during the further action exerted once the contact with the pipe (5) has occurred, are limited with respect to the dragging, advancing and/or pushing force and conditions before contact with the pipe (5).

9. A method as claimed in claim 8, characterized in that the dripping elements (4) are pushed, whereas the thrust limitation after contact takes place progressively, by means of elastic dampers.

10. A method as claimed in claim 8, characterized in that the dripping elements (4) are joined by friction means, to dragging, advancing and/or pushing means, and the advancing, dragging or pushing force limitation takes place by exceeding the frictional junction force.

11. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the compression pressure of the pipe (5) against the dripping elements (4) downstream from the first contact area acts outside the pipe (5), whereas the dripping elements are supported by abutment means (3).

12. A method as claimed in claim 11, characterized in that the external pressure is exerted by stationary means, i.e. means at least having surfaces of contact with the pipe (5) which are stationary with respect to

the advance motion of the pipe (5), and said means being adjustable with respect to their pressure force.

13. A method as claimed in claim 11, characterized in that the external pressure is exerted by means which passively accompany the advance motion of the pipe (5), i.e. by means having contact surfaces which may be moved according to the advance of the pipe (5).

14. A method as claimed in claim 11, characterized in that the external pressure is exerted by means which are driven by their own motion in a direction corresponding to the advance direction of the pipe (5), i.e. by means having at least one surface of contact with the pipe (5) which is driven so that it may be moved in the advance direction of the pipe (5), and exerting at the same time a dragging action on the pipe (5).

15. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that the pressure is exerted substantially perpendicularly to the surface of the pipe (5) and/or of the dripping elements (4).

16. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that the dripping elements (4) are supported by stationary slide abutments in the compression area, that is by surfaces which are stationary with respect to the advance motion thereof.

17. A method as claimed in ~~one or more of the preceding claims,~~ claim 1 characterized in that the dripping elements (4) are supported by abutments which passively accompany the advance motion of the dripping elements

(4) with the pipe (5).

18. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the dripping elements (4) are supported by abutments which actively accompany the advance motion of the dripping elements (4) with the pipe (5), being themselves driven by their own motion in the same direction as the advance direction of the dripping elements (4) with the pipe (5).

19. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the driving speed of the external presser means and/or of the internal abutments for the dripping elements (4) in the same direction as the advance direction of the pipe (5) is adjustable.

20. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the orientation of the dripping elements (4) and of the pipe (5) in the compression length is such that the two parts are parallel at least by their contact surfaces.

21. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the initial contact area between the dripping elements (4) and the pipe (5) and/or the compression length are provided in a conical narrowed length of the pipe.

22. A method as claimed in ~~one or more of the preceding claims~~ claim 1, characterized in that the dripping elements (4) are advanced on the feed path (3) continuously and consecutively, the distance between the individual dripping elements (4) on the feed path

(3) being greater than the distance between said dripping elements (4) when they are applied to the pipe, to an extent related to the difference between the speeds of the extruded pipe (5) and of the dripping elements (4).

23. A method as claimed in ~~one or more of the preceding claims 1 to 22~~ claim 1, characterized in that the dripping elements are advanced in a reciprocating stick-slip motion, there being provided a start station wherein each dripping element is kept still or anyway moved at a speed which is lower than or equal to that of the pipe and wherefrom said dripping element (4) is accelerated in the direction of the area of contact with the pipe (5) separately and directly or by successive dripping elements (4), arranged in a line in mutual contact, the acceleration action being exerted on the first dripping element (4) of the line at the rear end thereof with reference to the advance direction of the dripping elements (4).

24. A plant for implementing the method as claimed in ~~one or more of the preceding claims 1~~ claim 1 to 23, characterized in that said plant comprises:

a) Means (1) for extruding a plastic pipe (5), through an extruding head;

b) Calibrating means (6, 7) for progressively reducing the pipe (5) from the diameter coming out of the extruding head (1) to a final diameter along which reduction, the extruded pipe has a conical length.

c) Feeding means (3) for inserting consecutively a plurality of dripping elements (4), and keeping pace

with the advance of the extruded pipe (5), through the extruding head (1) and into the extruded pipe (5);

d) Conveying and/or pushing and/or dragging means (103, 11) for feeding each dripping element (4) to the area of the pipe whereat each dripping element (4) is brought to contact with a predetermined area of the inner surface of the pipe (5), while having a predetermined speed with respect to the speed of the pipe (5) when contact occurs;

e) Said speed of the dripping elements is selected as higher than the speed of the pipe (5) at least when contact occurs.

25. A plant as claimed in claim 24, characterized in that the means for advancing, dragging and/or pushing the dripping elements (4) are driven in such a way as to cause an impact of the dripping elements against the pipe which is meant to impress a mark in the contact area of the inner surface of the pipe (5).

26. A plant as claimed in ~~claims 24 or 25~~ claim 24, characterized in that it comprises means (3) for guiding the dripping elements (4), consisting of a stationary slide surface.

27. A plant as claimed in ~~claims 24 or 25~~ claim 24, characterized in that it comprises means (3, 103) for guiding the dripping elements (4), consisting of surfaces which are passively moved together with said dripping elements (4) or of rolling surfaces.

28. A plant as claimed in ~~claims 24 or 25~~ claim 24, characterized in that the guide means (3, 103) act, at

the same time, as means for dragging, advancing and/or pushing the dripping elements (4), being provided with surfaces for bearing the dripping elements (4), which are driven by a motion having the same direction as the advance direction of said dripping elements (4) inside the pipe (5).

29. A plant as claimed in ~~one or more of the preceding claims 24 to 28~~ claim 24, characterized in that the dragging, advancing and/or pushing means exert their action for a predetermined length even after the first contact between the dripping elements (4) and the pipe (5) has occurred, the means for guiding them (3, 103) extending also beyond the area of first contact with the pipe (5).

30. A plant as claimed in ~~one or more of the preceding claims 24 to 29~~ claim 24, characterized in that, in the area situated downstream from the area of first contact between the dripping elements (4) and the pipe (5), the dragging, advancing and/or pushing means are driven in the same way as in the area situated upstream from the area of first contact between the dripping elements (4) and the pipe (5), i.e. in such a way as to give the dripping elements (4) a speed which is higher than that of the pipe (5), whereas there are provided means for disengaging said dragging, advancing and/or pushing means from their respective dripping elements (4), in the area situated downstream from the area of first contact with the pipe (5), when a predetermined thrust thereof against the pipe (5) is attained, due to the different advance speeds.

31. A plant as claimed in claim 30, characterized in that the disengagement is obtained thanks to elastic means for damping the force for dragging, advancing and/or pushing the dripping elements (4) or thanks to friction means.

32. A plant as claimed in ~~one or more of the preceding claims 24 to 31~~ claim 24, characterized in that, in the area situated downstream from the first contact between the dripping elements (4) and the pipe (5), there are provided presser means (11, 11', 11"), outside the pipe (5), which are stressed by an adjustable compression force having at least one component perpendicular to the wall of the pipe (5).

33. A plant as claimed in ~~one or more of the preceding claims 24 to 32~~ claim 24, characterized in that the pressure means consist of a stationary presser means (11), i.e. a means at least having surfaces of contact with the pipe (5) which are stationary with respect to the advance motion of the pipe (5).

34. A plant as claimed in ~~one or more of the preceding claims 24 to 32~~ claim 24, characterized in that the presser means have a contact surface which passively accompanies the advance motion of the pipe (5), or a surface which is meant to roll thereon.

35. A plant as claimed in ~~one or more of the preceding claims 24 to 32~~ claim 24, characterized in that the presser means have one surface of contact with the pipe (5) which is driven by its own motion in the advance direction of the pipe (5), and which exerts a pushing and/or dragging action n the pipe (5) in the advance

direction.

36. A plant as claimed in ~~one or more of the preceding claims 24 to 35,~~ claim 24 characterized in that at least in the area of first contact between the dripping elements (4) and the inner surface of the pipe (5), the profile of the pipe (5) and the path of the dripping elements converge.

37. A plant as claimed in ~~one or more of the preceding claims 24 to 36,~~ claim 24 characterized in that in the area wherein the dripping elements (4) are compressed against the pipe (5), downstream from the area of first contact between said two parts, the profile of the pipe (5), i.e. of its wall, and the path of the dripping elements (4) are parallel or possibly slightly convergent.

38. A plant as claimed in ~~one or more of the preceding claims 24 to 37,~~ claim 24 characterized in that the first contact area is provided downstream from a first wall having the function to narrow the pipe (5) from the diameter coming out of the extruder to a first smaller diameter, and upstream from a succeeding intermediate or final calibrator for further narrowing the pipe (5) to a further intermediate smaller diameter or to the final smaller diameter.

39. A plant as claimed in claim 38, characterized in that the first contact area and/or the area wherein the dripping elements (4) with the pipe (5) are compressed are provided in a conical length of the pipe (5).

40. A plant as claimed in ~~one or more of the preceding claims 24 to 39,~~ claim 24 characterized in that the

means for advancing, dragging or pushing the dripping elements (4) are of the continuous of reciprocating type.

41. A method and a plant for fabricating drip irrigation pipes, wholly or partially as described, illustrated and for the purposes stated herein.